

CLAIMS

What is claimed is:

1. A method to retrieve elevation data, the method comprising:
 - 2 locating a first compressed portion of a Digital Elevation Model (DEM)
using a first index, the Digital Elevation Model comprising a
 - 4 plurality of compressed portions which includes the first
compressed portion, the first index pointing to a storage location
 - 6 where the first compressed portion is stored; and
decompressing the first compressed portion to retrieve first elevation data
 - 8 for at least one sample point in the Digital Elevation Model.
2. A method as in claim 1 wherein the plurality of compressed portions are
 - 2 stored in one of:
 - a) a Memory Mapped File (MMF);
 - 4 b) Random Access Memory (RAM); and
 - c) a file in a file system on a digital processing system.
3. A method as in claim 2 wherein the plurality of compressed portions are
 - 2 portions of compressed profiles in a first tile of the Digital Elevation
Model.
4. A method as in claim 3 further comprising:
 - 2 identifying the first tile, the first tile containing a first location and being
one of a plurality of tiles in an area of the Digital Elevation
 - 4 Model; and

- identifying a first profile that is in the vicinity of the first location, the
6 first compressed portion being a portion of the first profile.
5. A method as in claim 4 further comprising:
2 identifying the area, the area containing the first location and being one of
a plurality of areas of the Digital Elevation Model.
6. A method as in claim 1 wherein said decompressing the first compressed
2 portion comprises:
run length decoding the first compressed portion to generate scaled
4 elevation data;
inverse scaling the scaled elevation data to generate normalized elevation
6 data; and
adding a reference elevation to the normalized elevation data to generate
8 the first elevation data.
7. A method as in claim 1 further comprising:
2 identifying a plurality of sample points in the vicinity of a first location;
retrieving elevations of the plurality of sample points from the Digital
4 Elevation Model; and
computing an elevation of the first location from an interpolation using
6 the elevations of the plurality of sample points.
8. A method as in claim 7 further comprising:

2 performing a coordinate transformation to express a horizontal position of
the first location in a coordinate system used by the Digital
4 Elevation Model.

9. A method as in claim 7 further comprising:

2 providing the elevation of the first location to a Position Determination
Entity to perform altitude aiding in a positioning system.

10. A method as in claim 9 wherein said computing the elevation of the first
2 location comprises:

performing a coordinate transformation such that the elevation of first
4 location is expressed in a coordinate system used by the Position
Determination Entity.

11. A method to store elevation data, the method comprising:

2 compressing elevation data of a first portion of a Digital Elevation Model
(DEM) to generate first compressed elevation data;

4 storing the first compressed elevation data in a storage location pointed to
by a first index; and

6 storing the first index.

12. A method as in claim 11 further comprising:

2 storing parameters required for determining whether or not a location is
in the first portion of the Digital Elevation Model.

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13. A method as in claim 11 further comprising:
2 storing data specifying a coordinate system used to represent the
elevation data of the first portion of the Digital Elevation Model.
14. A method as in claim 11 wherein said compressing the elevation data of
2 the first portion comprises:
subtracting a reference elevation from the elevation data of the first
4 portion of the Digital Elevation Model (DEM) to generate
normalized elevation data; and
6 scaling the normalized elevation data to generate scaled elevation data.
15. A method as in claim 14 wherein said compressing the elevation data of
2 the first portion further comprises:
run length encoding the scaled elevation data to generate the first
4 compressed elevation data.
16. A method as in claim 11 wherein the first portion is a profile of the
2 Digital Elevation Model.
17. A method as in claim 11 further comprising:
2 dividing an area of the Digital Elevation Model into a plurality of tiles;
and
4 storing parameters required for determining whether or not a location is
in one of the plurality of tiles;

6 wherein the first portion is one of a plurality of profiles in one of the
plurality of tiles.

18. A method as in claim 17 further comprising:

2 dividing the Digital Elevation Model into a plurality of areas; and
storing parameters required for determining whether or not a location is
4 in one of the plurality of areas.

19. A machine readable media containing executable computer program

2 instructions which when executed by a digital processing system cause
said system to perform a method to retrieve elevation data, the method
4 comprising:

6 locating a first compressed portion of a Digital Elevation Model (DEM)
using a first index, the Digital Elevation Model comprising a
plurality of compressed portions which includes the first
8 compressed portion, the first index pointing to a storage location
where the first compressed portion is stored; and
10 decompressing the first compressed portion to retrieve first elevation data
for at least one sample point in the Digital Elevation Model.

20. A media as in claim 19 wherein the plurality of compressed portions are
2 stored in one of:

- a) a Memory Mapped File (MMF);
4 b) Random Access Memory (RAM); and
c) a file in a file system on a digital processing system.

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21. A media as in claim 20 wherein the plurality of compressed portions are
2 portions of compressed profiles in a first tile of the Digital Elevation
Model.
22. A media as in claim 21 wherein the method further comprises:
2 identifying the first tile, the first tile containing a first location and being
one of a plurality of tiles in an area of the Digital Elevation
4 Model; and
identifying a first profile that is in the vicinity of the first location, the
6 first compressed portion being a portion of the first profile.
23. A media as in claim 22 wherein the method further comprises:
2 identifying the area, the area containing the first location and being one of
a plurality of areas of the Digital Elevation Model.
24. A media as in claim 19 wherein said decompressing the first compressed
2 portion comprises:
run length decoding the first compressed portion to generate scaled
4 elevation data;
inverse scaling the scaled elevation data to generate normalized elevation
6 data; and
adding a reference elevation to the normalized elevation data to generate
8 the first elevation data.

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25. A media as in claim 19 wherein the method further comprises:
2 identifying a plurality of sample points in the vicinity of a first location;
retrieving elevations of the plurality of sample points from the Digital
4 Elevation Model; and
computing an elevation of the first location from an interpolation using
6 the elevations of the plurality of sample points.
26. A media as in claim 25 wherein the method further comprises:
2 performing a coordinate transformation to express a horizontal position of
the first location in a coordinate system used by the Digital
4 Elevation Model.
27. A media as in claim 25 wherein the method further comprises:
2 providing the elevation of the first location to a Position Determination
Entity to perform altitude aiding in a positioning system.
28. A media as in claim 27 wherein said computing the elevation of the first
2 location comprises:
performing a coordinate transformation such that the elevation of first
4 location is expressed in a coordinate system used by the Position
Determination Entity.
29. A machine readable media containing executable computer program
2 instructions which when executed by a digital processing system cause

said system to perform a method to store elevation data, the method

comprising:

compressing elevation data of a first portion of a Digital Elevation Model

(DEM) to generate first compressed elevation data;

storing the first compressed elevation data in a storage location pointed to

by a first index; and

storing the first index.

30. A media as in claim 29 wherein the method further comprises:

storing parameters required for determining whether or not a location is

in the first portion of the Digital Elevation Model.

31. A media as in claim 29 wherein the method further comprises:

storing data specifying a coordinate system used to represent the

elevation data of the first portion of the Digital Elevation Model.

32. A media as in claim 29 wherein said compressing the elevation data of

the first portion comprises:

subtracting a reference elevation from the elevation data of the first

portion of the Digital Elevation Model (DEM) to generate

normalized elevation data; and

scaling the normalized elevation data to generate scaled elevation data.

33. A media as in claim 32 wherein said compressing the elevation data of

the first portion further comprises:

- run length encoding the scaled elevation data to generate the first
4 compressed elevation data.
34. A media as in claim 29 wherein the first portion is a profile of the Digital
2 Elevation Model.
35. A media as in claim 29 wherein the method further comprises:
2 dividing an area of the Digital Elevation Model into a plurality of tiles;
and
4 storing parameters required for determining whether or not a location is
in one of the plurality of tiles;
6 wherein the first portion is one of a plurality of profiles in one of the
plurality of tiles.
36. A media as in claim 35 wherein the method further comprises:
2 dividing the Digital Elevation Model into a plurality of areas; and
storing parameters required for determining whether or not a location is
4 in one of the plurality of areas.
37. A digital processing system to retrieve elevation data, the digital
2 processing system comprising:
means for locating a first compressed portion of a Digital Elevation
4 Model (DEM) using a first index, the Digital Elevation Model
comprising a plurality of compressed portions which includes the

6 first compressed portion, the first index pointing to a storage
location where the first compressed portion is stored; and
8 means for decompressing the first compressed portion to retrieve first
elevation data for at least one sample point in the Digital
10 Elevation Model.

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38. A digital processing system as in claim 37 wherein the plurality of
2 compressed portions are stored in one of:
a) a Memory Mapped File (MMF);
4 b) Random Access Memory (RAM); and
c) a file in a file system on the digital processing system.

39. A digital processing system as in claim 38 wherein the plurality of
2 compressed portions are portions of compressed profiles in a first tile of
the Digital Elevation Model.

40. A digital processing system as in claim 39 further comprising:
2 means for identifying the first tile, the first tile containing a first location
and being one of a plurality of tiles in an area of the Digital
4 Elevation Model; and
means for identifying a first profile that is in the vicinity of the first
6 location, the first compressed portion being a portion of the first
profile.

41. A digital processing system as in claim 40 further comprising:

2 means for identifying the area, the area containing the first location and
being one of a plurality of areas of the Digital Elevation Model.

42. A digital processing system as in claim 37 wherein said means for
2 decompressing the first compressed portion comprises:
means for run length decoding the first compressed portion to generate
4 scaled elevation data;
means for inverse scaling the scaled elevation data to generate
6 normalized elevation data; and
means for adding a reference elevation to the normalized elevation data to
8 generate the first elevation data.

43. A digital processing system as in claim 37 further comprising:
2 means for identifying a plurality of sample points in the vicinity of a first
location;
4 means for retrieving elevations of the plurality of sample points from the
Digital Elevation Model; and
6 means for computing an elevation of the first location from an
interpolation using the elevations of the plurality of sample points.

44. A digital processing system as in claim 43 further comprising:
2 means for performing a coordinate transformation to express a horizontal
position of the first location in a coordinate system used by the
4 Digital Elevation Model.

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45. A digital processing system as in claim 43 further comprising:
2 means for providing the elevation of the first location to a Position
Determination Entity to perform altitude aiding in a positioning
4 system.
46. A digital processing system as in claim 45 wherein said means for
2 computing the elevation of the first location comprises:
means for performing a coordinate transformation such that the elevation
4 of first location is expressed in a coordinate system used by the
Position Determination Entity.
47. A digital processing system to store elevation data, the digital processing
2 system comprising:
means for compressing elevation data of a first portion of a Digital
4 Elevation Model (DEM) to generate first compressed elevation
data;
6 means for storing the first compressed elevation data in a storage location
pointed to by a first index; and
8 means for storing the first index.
48. A digital processing system as in claim 47 further comprising:
2 means for storing parameters required for determining whether or not a
location is in the first portion of the Digital Elevation Model.

49. A digital processing system as in claim 47 further comprising:
2 means for storing data specifying a coordinate system used to represent
the elevation data of the first portion of the Digital Elevation
4 Model.
50. A digital processing system as in claim 47 wherein said means for
2 compressing the elevation data of the first portion comprises:
means for subtracting a reference elevation from the elevation data of the
4 first portion of the Digital Elevation Model (DEM) to generate
normalized elevation data; and
6 means for scaling the normalized elevation data to generate scaled
elevation data.
51. A digital processing system as in claim 50 wherein said means for
2 compressing the elevation data of the first portion further comprises:
means for run length encoding the scaled elevation data to generate the
4 first compressed elevation data.
52. A digital processing system as in claim 47 wherein the first portion is a
2 profile of the Digital Elevation Model.
53. A digital processing system as in claim 47 further comprising:
2 means for dividing an area of the Digital Elevation Model into a plurality
of tiles; and

4 means for storing parameters required for determining whether or not a
location is in one of the plurality of tiles;
6 wherein the first portion is one of a plurality of profiles in one of the
plurality of tiles.

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54. A digital processing system as in claim 53 further comprising:
2 means for dividing the Digital Elevation Model into a plurality of areas;
and
4 means for storing parameters required for determining whether or not a
location is in one of the plurality of areas.

55. A machine readable media containing a data stream representing a Digital
2 Elevation Model, the data stream being produced by a method
comprising:
4 compressing elevation data of a first portion of a Digital Elevation Model
(DEM) to generate first compressed elevation data;
6 storing the first compressed elevation data in a storage location pointed to
by a first index as part of the data stream; and
8 storing the first index as part of the data stream.

56. A media as in claim 55 wherein the method further comprises:
2 storing parameters required for determining whether or not a location is
in the first portion of the Digital Elevation Model as part of the
4 data stream.

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57. A media as in claim 55 wherein the method further comprises:
2 storing data specifying a coordinate system used to represent the
elevation data of the first portion of the Digital Elevation Model
4 as part of the data stream.
58. A media as in claim 55 wherein said compressing the elevation data of
2 the first portion comprises:
subtracting a reference elevation from the elevation data of the first
4 portion of the Digital Elevation Model (DEM) to generate
normalized elevation data; and
6 scaling the normalized elevation data to generate scaled elevation data.
59. A media as in claim 58 wherein said compressing the elevation data of
2 the first portion further comprises:
run length encoding the scaled elevation data to generate the first
4 compressed elevation data.